

CHEMISTRY IN EVERDAY LIFE

- According 'WHO', a drug is defined as a substance or product which is used or intended to be used for modifying or exploring physiological systems or pathological states for the benefit of the recipient.
- They interact with targets and produce biological response.
- The drugs which produce therapeutic and useful biological response are called medicine.
- Chemotherapy is the use of chemicals for the therapeutic effect.

Classification of drugs:

➤ A) Based on Pharmacological effect:

- This classification is useful for doctors. Because the whole range of drugs available for the treatment of a particular type of problem.

Ex: (i) Analgesics have pain killing effect.

(ii) Antiseptic kills or inhibits growth of micro organisms.

➤ B) Based on drug Action:

- They were classified as antihistamines, cardiovascular drugs, sedatives, hypnotics.
- In living organism histamine is synthesized from the naturally occurring α amino acid histidine by the loss of carboxyl group through bacterial (or) enzymatic decarboxylation.
- Histamine causes inflammation in the body.
- All antihistamines inhibit the action of histamine in different ways.

➤ C) Based on Molecular targets:

- Drugs having same structural features will have same physiological and pharmacological effect

Ex: Morphine, Herion and Codeine have same structural features and relieve from pain and produce sleep.

➤ D) Based on Molecular targets:

- Usually drugs interact with biomolecules such as lipids, carbohydrates, proteins, nucleic acids called target molecules.
- Drugs possessing common structural features may have same mechanism of action on targets.

Therapeutic action of different kinds of drugs:

Antacids:

- Chemicals that remove the excess acid in the stomach and maintain the excess acid in the stomach and maintain the P^H to normal level are called antacids.

Ex: $MgCO_3$, $AlPO_4$; $NaHCO_3$, Magnesium trisilicate; omeprazol and Iansoprazole.

- A mixture of $Al(OH)_3$ and $Mg(OH)_2$ or $NaHCO_3$ can be used as antacids as they neutralize the acids.
- **Limitation of $NaHCO_3$** : Excess of $NaHCO_3$ makes the stomach alkaline and trigger the over production of acids.

TRANQUILIZERS

- Sedatives are drugs that exert a quieting effect accompanied by relaxation and rest but need not necessarily induce sleep.
- Barbituric acid, Luminal, Seconal, Valium Serotonin 520 etc., are the different types of tranquilizers.
- The sedatives and hypnotics are broadly classified into barbiturates and non barbiturates.

BARBITURATES:

- These are substituted pyrimidine derivatives
- The pH of barbituric acid ranges from 5.4 to 5.9
- Barbituric acid has no central nervous system (CNS) activity but its alkenyl and /or aryl derivatives have CNS activity.
- The general structure of barbiturates are

Diagram

- **Analgesics:** They reduce or abolish pain. Without causing disturbance of nervous system like impairment of consciousness, mental confusion, incoordination, paralysis etc. Analgesics are classified into two types

NON NARCOTIC ANALGESICS (NON-ADDICTIVE ANALGESICS)

- These act as analgesics without any addictive properties.
- The most commonly used analgesics are salicylates, aniline and aminophenol analogues pyrazolones and quinoline derivatives.
- **Aspirin:** (Mol.wt = 180; $C_9H_8O_4$)
- It is acetyl salicylic acid (or) salicylic acid acetate (or) O – acetyl salicylic acid.
- It was first prepared by Kolbe by refluxing salicylic acid with a mixture of acetic anhydride or acetic acid in the presence of H_2SO_4 (conc).

- It prevents blood clotting hence can be used for the prevention of heart attacks.
- **IBUPROFEN:** Chemically it is α methyl-4 (2 methyl propyl) benzene acetic acid.
- In its preparation from isobutyl benzene the following steps were involved.

USES:

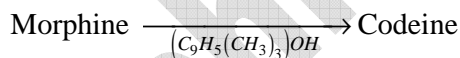
- It can be used as an anti-inflammatory, antipyretic and analgesic.
- It can be used for the treatment of rheumatoid arthritis and osteoarthritis.
- **Narcotic analgesics:** Alkaloids like morphine, codeine, papaverine and heroin are commonly used as narcotic drugs (opiates).
- Morphine narcotics are called as opiates as they are obtained from opium poppy.
- These relieve pain by acting on the central nervous system and produce sleep. Hence they are used for the relief of post-operative pain, cardiac pain, pains of terminal cancer and in child birth.

Morphine:

- i) On acetylation of one of the phenolic groups gives heroin.
- ii) It can be used to
 - i) Check diarrhea
 - ii) Ease dyspnea
 - iii) Suppress cough
 - iv) Induce sleep in the presence of pain

Codeine:

- i) It is a homologue and methyl derivative of morphine.
- ii) It can be obtained by methylation of one of the phenolic groups of morphine with phenyl trimethyl ammonium hydroxide



ANTIPYRETICS:

- Cohn and Hepp first time identified the antipyretic action of aniline and acetanilide

Paracetamol:

- Its IUPAC name is N-acetyl para aminophenol (Mol. wt = 151; $\text{C}_8\text{H}_9\text{O}_2\text{N}$).
- Chemically it is 4-hydroxy acetanilide or N-(4-hydroxy phenyl) acetamide.
- Paracetamol is a better drug than aspirin.

Advantage:

- It can be used for aspirin sensitive patients.

Phenacetin:

- Chemically it is [N-(4-ethoxyphenyl)] acetamide.
- It can be used as analgesic and antipyretic

Analgin:

- Chemically it is sodium 1,5-dimethyl-4-(3-oxo-2-phenyl-2,3 dihydro-1H-4 pyrazo-1-yl-1-methyl) – aminomethane sulphonate.
- It consists of a phenyl hydrazine and ethyl acetoacetate units
- It can be used as antipyretic and analgesic

Antimicrobials:

- Antimicrobials destroy/prevent the development (or) inhibit the pathogenic action of microbes such as bacteria, fungus, virus and other parasites.
- Antibiotics, antiseptics and disinfectants are antibacterial (or) antimicrobial drugs.
- Lysozyme is an enzyme present in tears, nasal secretion and saliva is useful in splitting lipids.
- a drug that kills microorganism in the body
- a drug which inhibits the growth of organism.

Antibiotics:

- According to Benedict and Langlykke antibiotic is derived (or) produced by a living organism which is capable in small concentrations inhibiting the life process of micro-organism
- Antibiotics are two types:
 - i) **Bactericidal:** They kill the microbes.
Ex: penicillin, amino glycosides, ofloxacin.
 - ii) **Bacteriostatic:** They inhibit the growth of microbes.
Ex: Erythromycin, Tetracycline, Chloramphenicol.

PENCILLIN:

- The first antibiotic discovered by Fleming (1929) is penicillin.
- It is a mixture of natural compounds having molecular formula $C_9H_{11}O_4N_4SR$
- Depending on the nature of R there are three types of penicillins if
R = pent – 2 – enyl ---- penicillin I or F
R = $-CH_2 - C_6H_5$ benzyl penicillin (or) penicillin II or G

R = - $CH_2 - C_6H_4$ -----n-heptyl penicillin

R = - $(CH_2)_4 - CH_3$ -----amyl penicillin

R = - $CH_2 - O - C_6H_5$ penoxy methyl – penicillin

➤ **SULPHADIAZINE:**

➤ Sulphadiazine is a sulpha drug

➤ It has a benzene ring and a heterocyclic aromatic 6 membered ring.

➤ Its molecular formula is $C_6H_{10}N_4SO_2$

➤ **Spectrum:** The complete range of micro organism that can be killed by a particular antibiotic is known as spectrum.

➤ **Broad spectrum antibiotics:**

i) These kill or inhibit a wide range of gram-positive and gram-negative bacteria.

Ex: Synthetic modifications of penicillins like ampicillin and amoxicillin, chloramphenicol, vancomycin, ofloxacin and dysidazine.

ii) Chloramphenicol is rapidly absorbed from gastrointestinal from hence it can be given orally for typhoid, dysentery, acute fever meningitis, pneumonia and for urinary infections.

➤ **Narrow spectrum antibiotics:** These will kill (or) inhibit either gram positive or gram negative bacteria. Ex: penicillin-G

➤ **Limited spectrum antibiotics:** These are effective against a single organism or disease.

➤ **Antiseptics:** These are applied to the living tissues such as wounds, cuts, ulcers and diseased surface. These are for external use only. Cannot be ingested like antibiotics

Ex:

1. Dettol – a mixture of chloroxylenol and terpineol

2. Tincture of Iodine-2-3% solution of I_2 in alcohol-water mixture.

3. 4% aq solution of formaldehyde is called formalin

4. Formalin is used (i) as disinfectant (ii) Preservation of biological specimens

➤ **Disinfectants:** These are applied to floors drainage system, and such inanimate objects.

Ex:

i) 0.2% phenol can act as antiseptic while 1% phenol is disinfectant.

ii) 0.2-0.4% chlorine water and SO_2 in very low concentrations can be used as disinfectants.

Antifertility Drugs:

➤ These are compounds of progesterone and estrogen hormones:

Ex:

i) Norethindrone is progesterone derivative

ii) Ethinylestradiol (novestrol) is estrogen derivative.

➤ Mifepristone is a synthetic steroid that blocks the effects of progesterone. Hence it is a constituent of morning after pill.

➤ Progesterone suppresses ovulation.

Chemical in food:

➤ Chemicals are added to food for their,

i) Preservation

ii) Enhancing appeal

iii) Increasing nutritive value

Anti oxidants:

➤ Retard the action of oxygen of food since they are more reactive towards oxygen than the food materials.

➤ They reduce the rate of involvement of free radicals in the aging process

➤ Generally used anti oxidants are butylated hydroxyl toluene (BHT) and butylated hydroxyl anisole (BHA)

➤ Food dyes have no nutritive value but sometimes are harmful particularly for children, asthma patients etc.

➤ **Food preservatives:** These prevent spoilage of food due to microbial growth, Ex: NaCl, Sugar, Vegetable oils, salts of sorbic acid & propionic acid. C_6H_5COONa also finds limited use as it is metabolised by the body.

Artificial sweetening agents:-

➤ Natural sweeteners like sucrose not only gives sweetness but also adds calories. Therefore the diabetic patients prefer to use artificial sweeteners instead of sucrose.

- **Ortho-sulphobenzamide:** is called saccharine. It is 550 times sweeter than cane sugar. It is harmless unlike sucrose.
- **Aspartame** is 100 times sweeter than cane sugar.
- **Alitame:** is high potency sweetener which is thousand times sweeter than sucrose and more stable than aspartame.
- **Sucrolose:** is trichloro derivative of sucrose. It is stable even at cooking temperatures. It cannot provide calories. Its appearance and taste are like sugar.

sakshieducation.com